Science; 2nd Mechanics; 3rd, Navigation; 4th, Civil and Military Engineering.

2nd Section—*Chemical and Physical Science*

5th, Physics; 6th, Chemistry; 7th, Meteorology and Physics of the Globe.

3rd Section—*Natural Sciences*

8th, Zoology and Zootechny; 9th, Botany; 10th, Geology and Mineralogy; 11th, Medicine.

4th Section—*Economic Sciences*

12th, Agriculture (*Agronomie*); 13th, Ethnography and Geography; 14th, Statistics.

We are told that certain modifications may be introduced before the final constitution of the Association, but they are not likely to change the general character of the institution.

Amongst the promoters of this Association are to be found the names most celebrated in French science, showing that this scientific movement is a general one, and answers to a pressing want.

A peculiar feature will be remarked: the general spirit of the statutes denotes a very decided tendency to *decentralisation.* Up to the present time French science has had the reverse tendency,—to attract to Paris all the intelligent strength of the nation. The result, most excellent for Paris, which constitutes one of the greatest scientific centres in the world, has been very disadvantageous for the country. The provincial *facultés* (local universities) have been deprived of the most important of their members, and are actually very far from answering to the scientific standard of the metropolis. If we add now that the *Ministère de l'Instruction Publique* not only has insufficient funds for these institutions of higher instruction, but considers the *facultés* as sources of revenue by the granting of degrees, it will be understood that it is the right time to act vigorously to raise the taste for science in the parts of the country remote from the capital.

Too much encouragement cannot be given to the founders of the French Association in their task of decentralising science in France. The first result will be to create real scientific centres, vigorous with a new life, and diffusing a great activity. It cannot be objected that the genius of the nation is opposed to such a decentralisation, and that all aspirations must necessarily converge towards Paris. This is an error. The town of Montpellier gives the example of a Faculté de Médecine, of which the reputation is scarcely inferior to the Paris *faculté.* It is equally certain that Toulouse the town of *Jeuxfloraux*, Lyons, Marseilles, Clermont, and many others, under a vigorous impulse, could also become great scientific centres. To aim at this object, nothing will be better than to show every year the whole scientific *corps* of Paris, the scientific *Etat-major* transporting itself to a remote city or town, liberally giving lectures and conferences, and promoting researches and experiments. Thus the metropolis will greatly help the scientific renovation, and will show that it wishes not to attract to itself the whole force and consideration, but to diffuse its own energy over the whole country.

It is probable that the first meeting will be held this year at Lyons, the second town of France, at the end of August or the beginning of September. To the interest of the meeting would be added the attraction of a great industrial exhibition.

We cannot do otherwise than wish a great success to the French Association. We are happy to see that all parties are uniting in their exertions in such a direction; that a good number of associates, independent or belonging to scientific societies, are giving in their adhesion to the new association. Amongst the congratulations which the Association ought to receive at its birth, no doubt one of the first will be addressed by the British Association. This will be for England both a duty and an honour. A nation must always be happy to be valued and proud to be imitated.

QUETELET'S CONTRIBUTIONS TO THE SCIENCE OF MAN

Physique Sociale, ou Essai sur le Développement des Facultés de l'Homme. Par Ad. Quetelet. (Brussels, 1869.)

Anthropométrie, ou Mesure des différentes Facultés de l'Homme. Par Ad. Quetelet. (Brussels, 1870.)

TWO lines of research into the Science of Man, of the highest moment as well in theoretical Anthropology as in practical Ethics and Politics, both to be always associated with the name of Quetelet, are now discussed at large in his Social Physics and Anthropometry. The two great generalisations which the veteran Belgian astronomer has brought to bear on physiological and mental science, and which it is proposed to describe popularly here, may be briefly defined. First, he has been for many years the prime mover in introducing the doctrine that human actions, even those usually considered most arbitrary, are in fact subordinate to general laws of human nature; this doctrine, maintained in previous publications, especially in the earlier edition of the first-named work some thirty-seven years ago, is now put forth in its completest form. Second, he has succeeded in bringing the idea of a biological type or specific form, whether in bodily structure or mental faculty, to a distinct calculable conception, which is likely to impress on future arguments a definiteness not previously approached.

The doctrine of the regularity and causality of human actions was powerfully stated some fifteen years ago by Mr. Buckle in the introduction to his "History of Civilisation." Buckle is here essentially the exponent of Quetelet's evidence, from which, indeed, as a speculative philosopher he draws inferences more extreme than those of his statistical teacher. To Quetelet is due the argument from the astonishing regularity from year to year in the recurrences of murders and suicides, a regularity extending even to the means or instruments by which these violent acts are committed; his inference being broadly "that it is society which prepares the crime, the criminal being only the instrument which executes it." From various other sources Buckle brought together other pieces of evidence, especially one which is now quoted by all who discuss the subject, the regularity from year to year of letters posted, whose writers forget to direct them. It may by this time be taken as proved by such facts that each particular class of human actions may be estimated, and to a great extent even predicted, as a regular product of a definite social body under definite conditions. To quote another luminous instance of this regularity of action, M. Quetelet gives a table of the ages of marriage in Belgium (Phys. Soc. i. p. 275). Here the numbers of what may be called normal marriages, those between men under 45 with women under 30, as well as of the less usual unions where the women are between 30 and 45, show the sort of general regularity which one would expect from mere consideration of the circumstances. The astonishing feature of the table is the regularity of the unusual marriages. Disregarding decimals, and calculating the approximate whole numbers in their proportion to 10,000 marriages, the table shows in each of five five-year periods from 1841 to 1865, 6 men aged from 30 to 45 who married women aged 60 or more, and 1 to 2 men aged 30 or less who married women aged 60 or more. M. Quetelet may well speak of this as the most curious and suggestive statistical document he has met with. These young husbands had their liberty of choice, yet their sexagenarian brides brought them up one after the other in periodical succession, as sacrifices to the occult tendencies of the social system. The statistician's comment is, "it is curious to see man, proudly entitling himself King of Nature and fancying himself controlling all things by his free-will, yet submitting, unknown to himself, more rigorously than any other being in creation, to the laws he is under subjection to. These laws are co-ordinated with such wisdom that they even escape his attention."

The admission of evidence like this, however, is not always followed by the same philosophical explanation of it. Buckle finds his solution by simply discarding the idea that human action "depends on some capricious and personal principle peculiar to each man, as free-will or the like;" on the contrary, he asserts "the great truth that the actions of men, being guided by their antecedents, are in reality never inconsistent, but, however capricious they may appear, only form part of one vast scheme of universal order, of which we, in the present state of knowledge, can barely see the outline." M. Quetelet's argument from the same evidence differs remarkably from this. His expedient for accounting for the regularity of social events without throwing over the notion of arbitrary action, is to admit the existence of free-will, but to confine its effects within very narrow bounds. He holds that arbitrary will does not act beyond the limits at which science begins, and that its effects, though apparently so great, may, if taken collectively, be reckoned as null, experience proving that individual wills are neutralised in the midst of general wills (p. 100). Free-will, though of sufficient power to prevent our predicting the actions of the individual, disappears in the collective action of large bodies of men, which results from general social laws, which can accordingly be predicted like other results regulated by natural laws. We may perhaps apprehend the meaning of Quetelet's views more clearly from another passage, where, to show how apparently isolated events may be really connected under some wide law, he compares single facts to a number of scattered points, which seem not related to one another till the observer, commanding a view of a series of them from a distance, loses sight of their little accidents of arrangement, and at the same time perceives that they are really arranged along a connecting curve. Then the writer goes on to imagine, still more suggestively, that these points might actually be tiny animated creatures, capable of free action within a very narrow range, while nevertheless their spontaneous movements would not be discernible from a distance (p. 94), where only their laws of mutual relation would appear. M. Quetelet can thus conciliate received opinions by recognising the doctrine of arbitrary volition, while depriving it of its injurious power.* His defence of the existence of free-will is perhaps too much like the famous excuse of the personage who was blamed for going out shooting on the day he had received the news of his father's death, and who defended himself on the ground that he only shot very small birds. But it is evident that the statistics of social regularity have driven the popular notion of free-will into the narrow space included between Quetelet's restriction and Buckle's abolition of it. In fact, no one who studies the temper of our time will deny the increasing prevalence of the tendency of the scientific world to reject the use of the term free-will in its vulgar sense, that of unmotived spontaneous election, and even to discourage its use in any other sense as apt to mislead, while its defenders draw their weapons not so much from observation of facts as from speculative and dogmatic philosophy.

To those who accept the extreme principle that similar men under similar circumstances must necessarily do similar acts; and to those, also, who adopt the notion of free-will as a small disturbing cause which disappears in the large result of social law, the regularity of civilised life carries its own explanation. Society is roughly homogeneous from year to year. Individuals are born, pass on through stage after stage of life, and die; but at each move one drops into another's place, and the shifting of individuals only brings change into the social system, so far as those great general causes have been at work which difference one age from another, the introduction of different knowledge, different principles, different arts, different industrial materials and outlets. The modern sociologist, whatever his metaphysical prepossessions, looks at society as a system amenable to direct cause and effect. To a great extent his accurate reckonings serve to give more force and point to the conclusions of rough experience; to a great extent, also, they correct old ideas and introduce new aspects of social law. What gives to the statistical method its greatest scope and power is that its evidence and proof of law applies indiscriminately to what we call physical, biological, and ethical products of society, these various effects acting and re-acting on one another. A few instances may be given to show the existence of the relations in question, without attempting to show their precise nature, nor to trace the operation of other determining causes.

Thus, for instance, the mode of life affects its length Statistics show that the mortality of the very poor is about half as much again as the mortality of the very rich; while as to the influence of professions, it appears that in Germany only twenty-four doctors reach the age of seventy as against thirty-two military men and forty-two theologians. The propensity to theft bears a distinct relation to age; thus the French criminal statistics estimate the propensity to theft between the ages of twenty-one and twenty-five, as being five-thirds as much as between the ages of thirty-five and forty. The amount of criminality in a country bears a relation, indirect and as yet obscure, but unmistakeable, to its education, or rather, to its want of education. In France, in 1828-31, the constant percentage of accused persons was about as follows: could not read or write, sixty-one; imperfectly, twenty-seven; well, twelve. The comparison of this group of numbers with those taken lately in England shows a great change of proportion—evidently resulting from the wider diffusion of education; but the limitation of crime to the less-educated classes is even more striking: cannot read or write, thirty-six; imperfectly, sixty-one; well, three. Again, for an example of connection of physical conditions with moral actions, we may notice a table, showing how the hours of the day influence people who hang themselves. (Phys. Soc. ii. 240.) The maximum of such cases, 135, occurred between six and eight in the morning; the number decreased slightly till noon, and then suddenly dropped to the minimum; there being 123 cases between ten and twelve o'clock, against only 32 between twelve and two o'clock. The number rose in the afternoon to 104 cases between four and six, dropping to an average of about 70 through the night, the second minimum, 45, being between two and four o'clock in the morning. Here it is impossible to mistake the influences of the periods of the day; we can fancy we see the poor wretches rising in the morning to a life of which the misery is beyond bearing, or can only be borne till evening closes in; while the temporary relief of the midnight sleep and the midday meal are marked in holding back the longing to self-destruction. Madness varies with the season of the year: the maximum being in summer, and the minimum in winter (p. 187); a state of things which seems intelligible enough. Again, it is well known in current opinion that more children are born in the night than in the day; in fact, there are about five night-born against four day-born, the maximum being about midnight, the minimum a little before noon (i. p. 208). Why this is no one yet knows; it is a case of unexplained law. But another not less curious law relating to births seems to have been at last successfully unravelled. In Europe about 106 boys are born to every 100 girls. The explanation appears to depend on the husband being older than the wife; which difference again is regulated by prudential considerations, a man not marrying till he can maintain a wife. In connection with this argument it must be noticed that illegitimate births show a much less excess of male children (p. 168). Here, then (if this explanation may be accepted), it appears that a law which has been supposed to be due to purely physiological causes is traceable to an ultimate origin in political economy.

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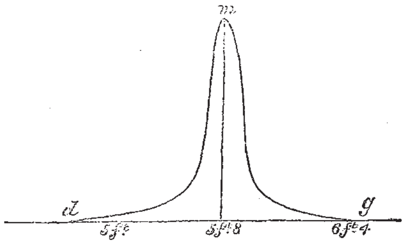
* In regard to the relation of statistics to the doctrine of fatalism, see Dr. Farre's "Report on the Programme of the Fourth Session of the Statistical Congress."

The examples brought forward by Quetelet, which thus show the intimate relation between biological and ethical phenomena, should be pondered by all who take an interest in that great movement of our time—the introduction of scientific evidence into problems over which theologians and moralists have long claimed exclusive jurisdiction. This scientific invasion consists mainly in application of exact evidence in place of inexact evidence, and of proof in place of sentiment and authority. Already the result of the introduction of statistics into inquiries of this kind appears in new adjustments of the frontier line between right and wrong, as measured under our modern social conditions. Take, for instance, the case of foundling hospitals, which provide a "tour," or other means for the secret reception of infants abandoned by their parents. It has seemed and still seems to many estimable persons an act of benevolence to found and maintain such institutions. But when their operation comes to be studied by statisticians, they are found to produce an enormous increase in the number of exposed illegitimate children (Phys. Soc. i. 384). In fact, thus to facilitate the safe and secret abandonment of children is to set a powerful engine at work to demoralise society. Here, then, a particular class of charitable actions has been removed, by the statistical study of its effects, from the category of virtuous into that of vicious actions. An even more important transition of the same kind is taking place in the estimation of almsgiving from the ethical point of view. Until modern ages, through all the countries of higher civilisation, men have been urged by their teachers of morality to give to the poor, worthy or unworthy; the state of public opinion being well exemplified by the narrowing of the word "charity" from its original sense to denote the distribution of doles. Yet, when the statistics of pauperism were collected and studied, it was shown that indiscriminate almsgiving is an action rather evil than good, its tendency being not only to maintain, but actually to produce, idle and miserable paupers. In our time a large proportion of the public and private funds distributed among the poor is spent in actually diminishing their industry, frugality, and self-reliance. Yet the evil of indiscriminate almsgiving is diminishing under the influence of sounder knowledge of social laws, and genuine charity is more and more directed by careful study of the means by which wealth may be spent for the distinct benefit of society. Such examples as these show clearly the imperfection and untrustworthiness of traditional, or what is called intuitive morality, in deciding on questions of right and wrong, and the necessity of appealing in all cases to the best attainable information of social science to decide what actions are really for or against the general good, and are therefore to be classed as virtuous or vicious.

Moreover, it is not too much to say that the comparatively small advance which moral science has made since barbaric ages has been due to the repugnance of moralists to admit, in human action, the regular causality which is the admitted principle of other parts of the action of the universe. The idea of the influence of arbitrary will in the individual man has checked and opposed the calculations which now display the paramount action of society as an organised whole. One point in M. Quetelet's doctrine of society requires a mention for its practical bearing on morals. There has seemed to some to be an immoral tendency in his principle that virtuous and vicious acts are products, not merely of the individual who does them, but of the society in which they take place, as though the tendency of this view were to weaken individual responsibility, and to discourage individual effort. Yet, when properly understood, this principle offers a more strong and definite impulse to the effort of society for good and against evil, than the theory which refers the individual's action more exclusively to himself. M. Quetelet's inference from the regular production of a certain amount of crime year by year from a society in a certain condition, is embodied in his maxim that society prepares the crime and the criminal executes it. This should be read with a comment of the author's. "If," he says, "I were to take up the pavement before my house, should I be astonished to hear in the morning that people had fallen and hurt themselves, and could I lay the blame on the sufferers, inasmuch as they were free to go there or elsewhere?" Thus every member of society who offers a facility to the commission of crime, or does not endeavour to hinder its commission, is, in a degree, responsible for it. It is absurd to suppose that the crimes in great cities are attributable altogether to the free agency of the poor wretches who are transported or hung for them. The nation which can and does not prevent the existence of a criminal class is responsible collectively for the evil done by this class. This we can see plainly enough, although the exact distribution of the responsibility among the different members of society may be impossible to determine. Such a theory, of course, casts aside the revenge-theory of criminal law, assimilating the treatment of criminals to the operation of a surgeon healing a diseased part of the body, if possible, or, if not, rendering it harmless or removing it.

The wealthy and educated classes, whose lives seem to themselves as free from moral blame as they are from legal punishment, may at first hear with no pleasant surprise a theory which inculpates them as sharers in the crimes necessarily resulting from the state of society which they are influential in shaping. Yet this consideration is by no means one of mere hopeless regret, for coupled with it is the knowledge that it is in their power, by adopting certain educational and reformatory measures, so to alter the present moral status of society as to reduce the annual budget of crime to a fraction of its present amount. Thus the doctrine that the nation participates in and is responsible for the acts of its individual members is one which widens the range of duty to the utmost. The labours of M. Quetelet in reducing to absolute calculation this doctrine of the solidarity of human society, entitle him to a place among those great thinkers whose efforts perceptibly raise that society to a higher intellectual and moral level. Here, as everywhere, the larger comprehension of the laws of nature works for good and not for evil in the history of the world.



Some slight account has now to be given of M. Quetelet's doctrine of typical forms, as displayed in the "homme moyen," or "mean man," of a particular nation or race. This is no new theory; but since the publication of the "Physique Sociale" in 1835, the author has been at work extending and systematising it, his last results being shown in the present works. First, it must be pointed out that the term "homme moyen" is not intended to indicate what would be popularly meant by an "average man." An average or arithmetical mean of a number of objects may be a mere imaginary entity, having no real representative. Thus, an average chessman, computed as to height from the different pieces on the board, might not correspond to any one of the actual pieces. But the "homme moyen" or central type of a population really exists; more than this, the class he belongs to exceeds in number any other class, and the less nearly any other class approaches to his standard the less numerous that class is, the decrease in the number of individuals as they depart from the central type conforming to a calculable numerical law. The "mean man" (the term may probably be adopted in future researches, and when technically used its popular meaning will cease to interfere with this special one)—the "mean man" thus stands as a representative of the whole population, individuals as they differ from him being considered as forms varying from his specific type.

To realise a conception which even among anthropologists has scarcely yet become familiar, it is desirable to show by what actual observations M. Quetelet was led to the discovery of his principle. When a large number of men of a practically homogeneous population are measured, and arranged in groups accordingly, it becomes evident that the individuals are related to one another by a law of distribution. A central type is represented by the most numerous group, the adjoining groups becoming less and less numerous in both directions. Thus, on classifying the measured heights of some 26,000 American soldiers of the Northern army during the late war, the proportionate number of men to each height was ascertained to be as follows (Phys. Soc. i. p. 131; Anthropom. p. 259):—

Height, inches	60	61	62	63	64	65	66	67	68
No. of men in 1,000 .	1	1	2	20	48	75	117	134	157
Height, inches	69	70	71	72	73	74	75	76	
No. of men in 1,000 .	140	121	80	57	26	13	5	2	

Here it is seen that the mean man is a little under 5 ft. 8 in. in height, the numbers of men shorter and taller diminishing with evident regularity, down to the few representatives of the very short men of 5 ft. and under, and the very tall men of 6 ft. 4 in. and over. The law of relation of height to numerical strength is shown graphically by the binomial curve figured above, where the abscissæ (measured from an origin on the left) represent the heights of the men, and the ordinates the relative numbers of men corresponding to each height. The maximum ordinate, representing the number of mean men, is at m = about 5 ft. 8 in., the ordinates on both sides diminishing almost to nothing as they reach the dwarfish and gigantic limits d and g, and vanishing beyond.

Again, measurement round the chest, applied to the soldiers of the Potomac army, shows a similar law of grouping (Phys. Soc. ii. 59; Anthropom. p. 289).

Round chest, inches	28	29	30	31	32	33	34	35
No. of men in 1,000 . . .	1	3	11	36	67	119	160	204
Round chest, inches	36	37	38	39	40	41	42	
No. of men in 1,000 . . .	166	119	68	28	13	4	1	

Here the mean man measures about 35 in. round the chest, the numbers diminishing both ways till we reach the few extremely narrow-chested men of 28in., and the few extremely broad-chested men of 42in. These two examples may represent the more symmetrical cases of distribution of individuals on both sides of a central type, as worked out by M. Quetelet from various physical measurements applied to large numbers of individuals. Here the tendency to vary is approximately equal in both directions. Where the tendency to vary is perceptibly different in the two directions the curve loses its symmetry, as in the figures representing the weights of women at different ages (Anthropom. p. 349), and the number of marriages of men and women at different ages (Phys. Soc. i. 272). The actual series of numbers given by observation are placed beside series computed according to the law of the expanded binomial, the same which is applied in the theory of probabilities to such calculations as that of the proportionate distribution of less probable events on each side of a most probable maximum term, the distribution of errors of observation of a single object, and of accidental variations in general. It is the closeness of approximation between the observed and calculated series of variations, computed not only as to the dimensions, but the actions of man, which gives to M. Quetelet's theory its remarkable definiteness and precision.

The diagram of statures here figured, which may be looked upon as representing a nation measured in one particular way, at once impresses on the mind a conception of a race-type materially differing from the vague notions hitherto current. It is seen that individual men of different statures are required to constitute a nation, but they are required in less and less proportion as they depart in excess or defect from the central type. The nation is not even complete without its dwarfs and giants. In fact, if all the monstrously short and tall men of a particular country were put out of sight, and the census of the population taken according to stature, the national formula thence deduced would enable a statistician to reckon with considerable accuracy how many dwarfs and giants of each size had been removed.

M. Quetelet's investigations further prove, or tend to prove, that similar laws of variation from the central type govern the distribution of individuals classed according to other bodily dimensions, and also according to physical qualities such as weight and strength, it being borne in mind that the particular expressions with their descriptive curves differ for the various qualities or faculties of man, being also in some cases much less symmetrical than in others. An absolute coincidence of the series of observed facts with the numerical law chosen to express them would be too much to expect; it is a great deal to obtain even a rough coincidence. For instance, when the strength of a number of men is estimated by a dynamometer, the maximum number showed 140 to 150 degrees on the scale, the number of weaker and stronger men being both fewer from this point, groups following approximately the proportions of the coefficients of a binomial of the 6th order; the numbers are reduced as follows from the table (Anthropom. p. 365):—

Renal force, degrees	90	100–110	120–130	140–150	160–170	180–190	200
No. of men in 64	1	8	14	20	15	6	1
Binom. coeff.	1	6	15	20	15	6	1

In the various numerical examples here given, the element of age is not introduced, the ages of the individuals being calculated or taken as uniform. The problem of variation of numerical distribution of a population at different ages is treated by M. Quetelet in a comparatively simple case, that of the stature-curve. Here a curve approximating to a parabola is laid down, the ages of man from birth onward being measured along its axis; each double ordinate of this curve forms the base on which a binomial curve is erected perpendicularly, the vertices of these curves forming a curve of mean stature, of the nature of a curve of mortality (Anthropom. p. 264). How far M. Quetelet may succeed in his contemplated purpose of carrying his method from the physical into the intellectual and moral nature of man, it is premature to judge.

Without entering into the more intricate and difficult problems opened by this theory of central types, it is evident that the bearing of its main conception on the problems of anthropology and biology in general is highly important. Some able anthropologists have accepted the theory of the mean or central standard as a basis for the comparison of races, but this line of research is still in its infancy. In M. Quetelet's last volume a principle is worked out which serves as a bridge between the old and new methods. His experience is that in a well-marked population no extraordinary number of observations is required for the determination of the mean man. In former ages, one result of the national type being so preponderant in number and so easily recognisable was that the bodily measurements of any man of ordinary stature and proportions could be trusted to give, with reasonable accuracy, the standard measures of the nation, such as the foot, cubit, fathom, &c. In the same manner M. Quetelet finds a small number of selected individuals sufficient for ascertaining the standard national proportions of the human body, male and female, from year to year of growth; his tables, founded for the most part on Belgian models, are given in an appendix. This method is applicable to the purposes of general anthropology. Thus a traveller, studying some African or American race, has to select by mere inspection a moderate number of typical men and women, by comparison of whose accurately admeasured proportions he may approximate very closely to a central race-type.* It is not necessary to dwell on the obvious difficulties of connecting the standard types of mixed nations with the races composing them. The stature-curve of England differs visibly in proportions from that of Italy, the measurements of Scotch and American soldiers show very different mean and extreme terms, and the problems of race underlying these differences are of a most complex character, the more so when the consideration is introduced of the race-type varying within itself from century to century. M. Quetelet is naturally apt, when expressing his views in an exordium or a peroration, to draw a good deal on the anticipated future results of his admirable method; but in judging of the value of his doctrine of central types, the best criterion is his actual success in reducing the observed facts of nature to numerical calculation. The future must show how far it will be possible to apply to the theory of species the definition of central specific forms, from which varieties calculably diminish in numbers as they depart in type.

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* Thus General Lefroy's measurements of thirty-three Chipewyan Indians ("Journal of the Ethnological Society," vol. ii. p. 44, 1870) are sufficient to determine the stature of the mean man as about 5 ft. 7 in., the number of individuals in this maximum group being 8. It is even possible to guess from this small number of measurements the numerical law of variation in the tribe, the series of groups from 5 ft. 3 in. to 5 ft. 11 in. being as follows:—1, 1½, 2½, 6, 8, 4½, 4½, 3, 1.

E. B. TYLOR

OUR BOOK SHELF

Magnetism. By Sir W. Snow Harris and H. M. Noad. (London: Lockwood and Co.)

THIS is a good book, and we are glad to see the subject of magnetism fully treated in a popularly written text-book. It is a second edition of Sir William Snow Harris's rudimentary treatise, with considerable and important additions by the editor. The part of chief importance which is added is Chapter viii., which deals with the more recent progress of terrestrial megnetism. This chapter consists of thirty pages, and the author has managed to condense into that space a wonderfully large amount of interesting, useful, and accurate information on the subject. In so short a space we must be content with results rather than with particulars, but the matter contained in this chapter, in point of importance, accuracy, and exhaustiveness, places the present treatise, as far as terrestrial magnetism is concerned, much before any similar book with which we are acquainted. The correction of the compass in iron ships is entered into in the last chapter. The telegraph is scarcely touched upon, but this perhaps rather belongs to a treatise on electricity. We have a chapter on theories of terrestrial magnetism. The theory of Gauss should never be classed, as it is here, and indeed as it is generally classed, along with theories like those of Halley or Hanstein, or with such things as electro-magnetic theories and the like. The word "theory" in these cases means quite a different thing from what it means when applied to Gauss's investigations. Hanstein and the like all make some physical hypothesis, which may or may not be the case; but Gauss makes no such assumption at all, except in so far as he supposes that the needle at all parts of the earth's surface is affected by forces due to the same origin, and varying inversely as the square of the distance, which has been experimentally proved to be the law according to which magnetic forces act. He then shows how the effect on a needle can be expressed in terms of an infinite series which is necessarily mathematically convergent and true, and he then uses an approximation to that series, which approximation is justified fully by experiments similar to those made by the late Prof. Forbes at the top and bottom of the Faulhorn. Gauss's theory, then, is a truly scientific theory, inasmuch as it involves no unjustified physical hypothesis, but is a logical deduction from observed facts and established principles, and in this differs radically from the other theories which are too often classed with it. Dr. Noad has been so successful in Chapter viii. that we cannot help wishing he had introduced a chapter also on this subject.

JAMES STUART

The Amateur's Flower-Garden: a Handy Guide to the Formation and Management of the Flower Garden and the Cultivation of Garden Flowers. By Shirley Hibberd. Illustrated with coloured plates and wood engravings. (London: Groombridge and Son, 1871.)

MR. HIBBERD is a practised writer on gardening subjects, though his books have not much claim to be considered as scientific treatises, but rather as pretty gift-books to lie on the drawing-room table and give to its furniture a *quasi*-scientific air. That they have their use cannot be doubted, but it is not a very high one. The worst part of this book is the illustrations. From the letterpress may be doubtless culled some useful hints as to the planting and management of a flower-garden, though we do not think it equal in this respect to some other works, such as those by Mr. Robinson, which are less under the trammels of time-honoured prejudices and superstitions. But many of the illustrations, including some of the woodcuts and nearly all the coloured plates, are simply atrocious. The drawings of a show pelargonium (p. 80), pansy (p. 45), ranunculus (p. 156), carnation (p. 117), and some others, are mere caricatures, and unworthy of a place in any work which bears the least pretensions to a scientific character.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

The Survival of the Fittest

I HAD designed sending a note to you, critical of the abstract of my paper on "The Laws of Organic Development," republished from the *American Naturalist* in one of your recent issues, before I read the remarks of Mr. Spencer in your number of February 1.

If Mr. Spencer will examine the Essay itself (for sale by McCalla and Stavely, 237, Dock Street, Phila., or Naturalists' Book Agency, Salem, Mass.*) he will find that I have there exclusively employed his phrase "Survival of the Fittest." The expression "Preservation of the Fittest," not used by Mr. Spencer, was inadvertently introduced in writing the abstract. This was done hurriedly between the sittings of the Amer. Assoc. Adv. Sci. for a reporter of the *New York Tribune*, and was subsequently printed by the *Naturalist* while I was absent on the Plains of Kansas. It therefore contains several obscurities, the result of an attempt to abridge, and a number of typographical blunders. The essay will be found to be free from these.

There being no misrepresentation of Mr. Spencer's views on this point, I notice the second objection he makes. Where, in the sentence regarding the Survival of the Fittest, I say that "this neat expression no doubt covers the case, but it leaves the origin of the fittest entirely untouched," Mr. Spencer regards my language as an "indirect statement that I" (Mr. S.) "have done nothing to explain the origin of the fittest."

It is plain enough that my remark does not apply to Mr. Spencer or to his writings, but exclusively to the doctrine of Natural Selection, and to Mr. Spencer's terse phrase, "which no doubt covers the case," *i.e.* Natural Selection (not the whole theory of Evolution). I cannot see that this language can be tortured into the interpretation Mr. Spencer places upon it, but Mr. Spencer's language decidedly implies that my statement is literally correct.

I am, however, well aware that Mr. Spencer has done more than any living man to explain the "Origin of the Fittest," and on this account in particular his name does not appear in my criticism. Another reason for its omission is that I have taken the liberty not to read his work, "The Principles of Biology," because I have suspected, from my reading of other works of this philosopher, that it is in advance of other treatises on the subject. I postponed it until, by investigation "in the shop," I should have attained to some definite views based on reasoning uninfluenced by the opinions of others, hoping to use "The Principles of Biology" thereafter in such a way as its merits and justice to its author should require.

EDWARD D. COPE

Philadelphia, Feb. 20

Ethnology and Spiritualism

THERE is only one point in Mr. Tylor's communication (NATURE, Feb. 29, p. 343) on which it seems desirable that I should say a few words, in order that I may not be supposed to assent to what I conceive to be a most erroneous view. Mr. Tylor suggests that the phenomena that occur in the presence of what are called mediums, are or may be of the same nature as the subjective impressions of persons under the influence of a powerful mesmeriser. Five and twenty years ago I was myself

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* Under the title, "The Method of Creation of Organic Types."